

## PATENT COOPERATION TREATY

PCT/EP2003/001658



## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 02017WO/Sa	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP2003/001658	International filing date ( <i>day/month/year</i> ) 19 February 2003 (19.02.2003)	Priority date ( <i>day/month/year</i> ) 05 March 2002 (05.03.2002)
International Patent Classification (IPC) or national classification and IPC F16D 69/02		
Applicant CERAMTEC AG		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 01 October 2003 (01.10.2003)	Date of completion of this report 22 June 2004 (22.06.2004)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/EP2003/001658

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

- ☐ the international application as originally filed
- ☒ the description:  
pages \_\_\_\_\_, 1,3-6 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, 2,2a \_\_\_\_\_, filed with the letter of \_\_\_\_\_ 26 April 2004 (26.04.2004)
- ☒ the claims:  
pages \_\_\_\_\_, 2-18 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement under Article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, 1 \_\_\_\_\_, filed with the letter of \_\_\_\_\_ 23 April 2004 (23.04.2004)
- ☐ the drawings:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/fig \_\_\_\_\_

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/EP 03/01658**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	1-18	YES
	Claims		NO
Inventive step (IS)	Claims	1-18	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims		NO

**2. Citations and explanations**

This report refers to the following documents:

D1: GB-A-1 415 507

D2: US-A-5 620 791

D3: WO 99 11448 A

Due to the selection of constituents specified in claim 1 the metal-ceramic composites are novel in relation to the materials indicated in documents D1-D3 and are characterized by new unexpected properties that are particularly well suited for the inserts as specified in claims 7-18.

The documents cited give no incentive therefor and hence the subjects of claims 1-18 show novelty, inventive step and industrial applicability.

crystallize out due to the temperature change, which, after a period of rest, increases the breakaway/starting torque and, in the worst case, leads to seizure of the slide pairing.

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This can occur both with rotating sealing units and with those undergoing translational movement.

Low mechanical values such as the tensile strength, flexural strength and hardness of a slide partner, for example carbon with values of 30 to 80 MPa, additionally restrict the range of uses of the above-mentioned sealing units. Fillers, particularly impregnations, may be partially attacked. Chemically aggressive media cause the impregnations to swell and thereby change the tribological conditions. This is a further possible cause of a temperature increase in the gap.

Temperature and pressure change the geometry and hence the original setting of a slide pairing, which as a rule impairs performance.

British patent 1,415,507 describes a seal for engines and compressors wherein the material consists of a mixture of aluminium powder and alumina powder, melted in a plasma flame, which is sprayed onto a rotating surface. This produces a special material structure in the form of platelets. After the solidified material has been comminuted, a sintered compact is produced from the powder by hot compression.

US patent 5,620,791 discloses the manufacture of brake disks from an MMC. In a first step, molten aluminium as the matrix metal diffuses into a filler material, for example silicon carbide or aluminium oxide, and solidifies. In a second step, this MMC is remelted and dispersed in a melt of a second matrix material, this material containing a ceramic material, a CMC and a metal.

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It is known from PCT specification WO 99/11448 to manufacture mouldings by the centrifugal moulding process wherein, to reinforce the material, particles, platelets, whiskers or short fibres of a hard substance, for example silicon carbide, boron carbide, titanium carbide, silicon nitride, alumina or graphite, or combinations of these substances, are added e.g. to an aluminium melt. The effect of the centrifugal force is to distribute the particles in the melt, and subsequently in the solidified moulding, as a function of their mass in the form of a gradient.

The object of the present invention is to provide a favourable friction/slide system which meets the following requirements: constant friction/slide properties, high thermal conductivity, dimensional stability due to high modulus of elasticity, and high strength.

This object is achieved by selecting specific materials and material pairings.

Materials according to the invention that have the requisite properties include metal-ceramic composites, or MCCs, consisting of one or more metallic phases in a proportion of 30 to 75 vol.% and one or more non-metallic inorganic components in a proportion of 25 to 70 vol.%. Preferred metallic phases are aluminium and its alloys. The non-metallic ceramic